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TRANSLATIONS ON EASTERN EUROPE

SCIENTIFIC AFFAIRS

No. 549

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BULGARIA

CERTAIN SURGICAL PRACTICES CRITICIZED

Sofia ZDRAVEN FRONT in Bulgarian 23 Apr 77 p 2

[Article by Prof Dr Petur Deenichin, Medical Faculty, Plovdiv: "Medical Deontology in the Field of Surgery"]

[Text] Surgery is subject to the general requirements of medical deontology. It also has its own deontological tasks, which derive from the application of operating methods. A. V. Gulyaev points out: "The surgeon is a man armed with a knife, and like any armed person he poses a danger to the environment if he uses his weapon where it is not necessary or in ways that are not acceptable."

An important problem, from the deontological point of view, is the regulation of the volume of work of every surgery department and clinic.

Major operations should not be performed in small rayon hospitals where conditions are lacking for the examination and preoperative preparation of patients, where there are not enough qualified surgeons and conditions are lacking for postoperative care, and so on. There are cases in which the patient, instead of being sent quickly to a qualified institution, is operated on in a small hospital and sent where he should be only when complications set in. Frequently a reoperation is required, the healing process is delayed and more costly, and in connection with this adverse results are quite likely.

With interaction between large and small surgery collectives it is essential to have truly effective exchange of experience and timely adoption of new advances in practice. In the interest of the patients, it is not right to be "enslaved" to old, outmoded medical procedures when a neighboring hospital is using techniques leading to outstanding successes.

Moreover, anesthesia for surgical intervention and traumatizing manipulations is not carried out from the standpoint of maximally protecting the patient's peace of mind. Planned and emergency operations are started and finished without complete anesthetization, and a number of extremely painful examinations are made without any care whatsoever taken to ease perceptions of pain. It has become everyday practice for young physicians in outpatient clinic

situations, in cases of long-secreting operation wounds (most often due to filarian fistulae), to thrust instruments deep, "seek out and remove stitches," without any kind of anesthesia, and repeatedly, every time the patient comes in for bandaging. One girl of 16 had attempted suicide, after which she was "treated" in that manner for several months.

The reason that modern anesthesia is not applied in all cases is to be found in the lack of enough anesthesiologists, the inadequate qualifications of some of them, examinations which frequently, although proper in principle, are not in harmony with the condition and interests of the patient at a given moment. There are also surgeons who do not take easily to new developments.

There has never been a patient who has not experienced agitation and fear before a forthcoming operation. The degree of suffering depends on the nervous system, on the one hand, and the number and kind of his uncertainties before being taken into the operating room, on the other. Considering the sufferings of patients waiting for an operation, the sleepless nights, and so on, we should not blithely put off scheduled operations for a later day or indefinitely. In preparing patients for operation it is necessary to consider examinations beforehand and prepare for them, also organizational problems, in order not to give cause for unnecessary mental distress.

While taking the position of trying as far as possible to satisfy patients' preference for some surgeon or other, we are decisively against "elevating to a cult" the personality of the surgeon and assigning credit to him alone for success or failure. The creation of such a "cult" is indicated by the fact that if the patients have not met the operating team in advance, immediately after waking up they ask: "Who operated on me?"

The second question which patients and their relatives ask the surgeon is: "Is the operation a success?" The people are probably putting into that phrase all their hope for recovery and are in a hurry to find out whether their hope is justified. To the surgeons, this question is largely meaningless, and for this reason their answers are rarely categorical, since the outcome of an operation largely depends both on the situation, which cannot always be foreseen, and on competent and timely postoperative care.

Conversations between surgeon and patients should create a sense of optimism and faith in the healing process. We are of the opinion that a treating physician or surgeon does not need to inform the patient about every detail of the course of the examinations or the upcoming operation. He must always have an idea of the cultural level of the patient and be logical and persuasive, even when the working diagnosis turns out to be wrong or changes must be made in the medical tactics during the course of the operation.

The surgeon's words must always coincide with the facts and be in harmony with the overall situation in the surgery department or clinic. For someone awaiting an operation there is no stronger encouragement than that of seeing

with his own eyes how well all the patients are cared for, how quickly they are on their feet again after the operation, and how fully they recover--especially if they have the same disorder he has.

We believe that the practice of "playing it safe" which is entrenched in some surgery collectives is not a correct one--the practice of having patients submit a written consent to the operation, or in more difficult cases "having relatives sign also." In both cases, mental distress is inflicted on the patient and his loved ones, and the effect on the physicians gives rise to doubts and frequently unfounded apprehensions, reactions, and hesitations. Any surgery carries a certain amount of risk, but the surgeon should not be afraid of it if he complies strictly with all medical, ethical, and legal norms in his actions. In the event of deviation from those principles, the patient's or his relatives' written consent will in no way absolve the surgeon of administrative or legal liability.

Care given to incurable patients should not differ from that given to any others. Until the final breath we should be gentle, boost morale, and stimulate metabolic processes. Some physicians, when the end is in sight, carry out meaningless examinations with the sole aim of ensuring that the clinical diagnosis coincides with the pathoanatomical one. Others, minutes or hours before the end, transfer the dying patient from one institution to another, forgetting the patient and thinking only of the report indicators. Proof of this is the fact that two-thirds of the mesenteric thrombosis patients who died with us were brought to the surgery clinic from other medical institutions.

The younger generation of surgeons who grew up and were educated during the years of people's rule, the majority of whom comply with deontological norms and requirements, give us reason to believe that they will honorably and worthily fulfill their duty to restore working people to vigorous health.

9078

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COMPUTER PRODUCTS DESCRIBED

Sofia ECONOMIC NEWS OF BULGARIA in English No 3, 1977 p 7

[Article by Eng. G. Sprostranov, Deputy Director General of the Elektronika Works]

[Text]

The modern *ELECTRONIKA* works in Sofia produces software for large digital electronic computers, ISOT-0310 mini-computers intended for scientific research, the monitoring of technological processes, the management of business organizations and the processing of economic information. Electronic cash registers are also produced for the home market and for export.

The mini-computers, electronic cash registers and the EC-0823 input cabinet for EC-2622 processors meet the established international standards.

The ISOT-0310 systems are available in the form of a minimal system configuration with a central processor and 8 kiloword storage capacity, controllers, quick perfo-tape readers and quick tape perforators, tracks for programmed information processing, a special track for direct access to the operative memory and teletype.

The ISOT-0310 systems are built on the module principle. Each module is functionally and constructively an independent

unit, interacting with other modules via a standard interface. These open systems make it possible to team up new devices without changing the equipment.

Commercial computers use as peripheral memories ISOT-5003 storage capacities.

The information of the ELKA-89-2-01 electronic cash registers is recorded on magnetic cassettes with a ZUMK-212 memory storage device. The information is fed into the computer by a Module-8 block of tracks and read off a ZUMK-212A reader.

Clients are given test programmes for the systems, as well as a POS-1 perfo-tape operational system and a DOS/310 operational disc system for the preparation, translation, setting and carrying out consumer programmes. Commercial systems are supplied together with the respective practical programmes.

ELECTRONIKA apparatuses and devices find a good market in the USSR, Poland, the GDR, Hungary, Czechoslovakia, Romania, India and other countries.

Elektronika maintains close contacts with factories of the UNITRA and MERA associations in Poland, from which it receives mosaic printed circuits, certain types of transformers and other parts and assemblies.

Within the framework of the CMEA development programme,

Elektronika is a specialized producer of electronic cash registers and certain systems for the management of commercial enterprises.

Elektronika products have won six GOLD MEDALS at major international fairs and three Honorary Diplomas at the INTERORG-TECHNICA exhibition in Moscow.

This year *ELECTRONIKA* is scheduled to exhibit its mini-computer systems and electronic cash registers at the international fairs in Plovdiv, Lisbon and Salonica, and at the specialized exhibitions in Riga, Warsaw, Prague, Belgrade, Istanbul, Zagreb, Dresden, Munich, Vienna and Madrid.

PRODUCTS OF MANOMETER PLANT DESCRIBED

Sofia ECONOMIC NEWS OF BULGARIA in English No 3, 1977 p 7

[Article by T. Yanev]

The Manometer Plant in Varna will celebrate its 15th anniversary this year fifteen years in which it has developed into an up-to-date producer of a number of instruments and devices working on the manometric principle. The greater part of its output is sold abroad.

Manometers, vacuum-meters and manovacuum-meters with a diameter of 40, 60 and 100 mm account for 80 per cent of its volume of production. They include an extensive range of gauges for measuring pressure, dimension and special parameters, and may be used at all types of industrial enterprises in any country.

Many of the manometers are exported to the GDR, the USSR and Poland. Under a bilateral accord with the GDR, several types of 100 mm manometers are produced for the Bulgarian and GDR markets. The GDR, on its part, produces 160 mm manometers for itself and Bulgaria.

Increasing deliveries are being made to Czechoslovakia, Iran, the Federal Republic of Germany, Greece and other countries.

The Manometer Plant in Varna produced three million meters and other manometric devices last year, which places it among the six largest European manufacturers of manometers. It has its own research and development centre, laboratory, experimental sections and instrumental departments, where all models go through rigorous trials under operational conditions before they are approved for marketing.

The Manometer Plant uses most modern technologies, presses, welders and lacquering devices, involving a large degree of automation.

The plant also produces various gauges for tractors and motor vehicles.

It will shortly expand its production list by adding pneumatic distributors, programming devices, signal systems, block filters, contacts, switches and others, which are widely used for the automation of industrial production processes.

DEVELOPMENTS IN LASER SPECTROSCOPY DESCRIBED

East Berlin SPEKTRUM No 3, March 1977 pp 14-17

[Article by Professor Dr. sc. Johannes H. Hertz, Dr. rer. nat. Dieter Leupold, and Dr. rer. nat. Wolfgang Radloff, of the Central Institute for Optics and Spectroscopy: "New Methods in Laser Spectroscopy"]

[Text] A large number of application possibilities in science and technology result for modern quantum electronics from the specific properties of laser radiation. It is therefore not surprising that the third international meeting "Lasers and their applications", which is being sponsored this month in Dresden by the Central Institute for Optics and Spectroscopy of our Academy and the GDR Physical Society, is of significance not only for experts. It also engenders special interest among scientists, engineers, and technicians from other areas of basic research, from industrial research, and even from production. For example, industrial cutting and drilling with lasers which is already today very widely used and facilitates and improves material machining, is of considerable economic benefit. Length and distance measurement with laser light is superior to conventional techniques with respect to accuracy and productivity, which is particularly important for construction work in the case of laser alignment. Areas of application which are significant for the future are data transmission with light conductors and optical information processing, laser-induced isotope separation, the effects on photochemical reactions, and nuclear fusion by laser radiation, which is accorded much international discussion.

In addition to these problems, the use of lasers in optical spectroscopy will represent a special emphasis in the discussions of the Dresden meeting. This is explained by the need of all natural science disciplines for modern research technologies for material investigations and analysis, for which laser radiation is especially suitable. Thus, the monochromatism of this radiation, which can surpass the resolution capability of conventional spectrometers by several orders of magnitude, makes it possible to obtain

absorption spectra with a maximum possible information content. This is of particularly great practical importance for vibration spectroscopy in the infrared spectral range, which has an abundance of lines, because the high detection selectivity and sensitivity can be very effectively utilized for process control and environmental monitoring.

In addition to these conventional measuring processes, in which the laser only fulfills the function of an improved light source, it was however possible to develop completely novel spectroscopic methods. For example the methods of nonlinear absorption spectroscopy (or saturation spectroscopy) are based on the possibility of using lasers to produce radiation fields with very high spectral and spatial energy density. When they are in resonance with atomic or molecular transitions, these radiation fields lead to an effective redistribution of the phonon numbers of the participating energy conditions, and thus also to a decrease in the lower molecules, which are in the unexcited condition. As a consequence, a deviation from the Lambert-Beer law is observed: the absorption coefficient no longer proves to be a constant quantity under these conditions, but it is a function of the intensity of the laser radiation, so that the term nonlinear absorption spectroscopy is rightfully applied. A molecular structure which is thus disturbed can now be utilized in various ways to obtain spectroscopic information. Let us first consider the method of high resolution saturation spectroscopy, proposed by the Soviet physicist V. S. Letochow, which should become significant for gas analyses, among other applications.

It is known that the characteristic motion of the gas molecule results in a considerable broadening of all absorption lines of a gas due to the Doppler effect. We know the effect of this Doppler effect from our daily lives, when a source of noise, for example a whistling locomotive, moves past us rapidly. In this case, a change in pitch, i.e. a change in tone frequency of the signal, can be observed, because the source of the sound first moves towards us and then away from us. As a function of the relative speed which prevails between the observer and the molecule, a shift of the optical absorption, respectively emission frequency and thus the observed length of the wave occurs similarly, from which the Doppler broadening of the spectral lines results due to the molecular motion which is unordered in the gaseous phase.

If the distance of the wavelengths between the individual lines is smaller than the broadening of these lines which is caused by the Doppler effect, their line contours overlap and "melt" into considerably broader lines, or, in the case of many lines, into bands. In principle, the separation or resolution of the individual lines cannot be carried out in these conditions by the use

linear, conventional absorption spectroscopy. This situation could be addressed only if it would be possible to select groups of molecules with a uniform velocity in the direction of observation and to carry out spectroscopic measurement on them. In this case, the Doppler effect would also result in a line displacement, but not in a broadening, because the displacement would be the same for all molecules of the group. Such a selection is basically possible by the use of molecular radiation, but it can be carried out considerably simpler and more effectively with the laser.

If the monochromatic radiation of a single mode laser is divided into two beams of vastly different intensity, for example, and the two beams are moving through the measuring bulb in opposite directions, so that, in the area of the gas which is to be investigated, the two beams penetrate each other frontally, different groups of molecules will have an exchange effect in the general case, as a result of the Doppler effect (the "observation directions" of the two radiation beams are differentiated by 180° , they are opposed to each other!).

A saturation caused by the more intense beam will result in a deviation from the linear absorption characteristic for this beam, the oppositely directed less intense probing beam does however not feel any effect from this because it is in resonance with another group of molecules. Only in the case where both radiation beams are in exchange effect with the same group of molecules, will the probing beam be affected by the saturating effect of the other beam and will be absorbed less intensely when passing through the measuring bulb. It can be easily understood that this case occurs only for the exchange effect with those molecules which are at rest with respect to the broadening direction of the two laser beams. By means of suitable manipulation of the oppositely directed laser radiation, and utilizing the nonlinear absorption, the desired selection of a molecular group with a uniform velocity component, namely the velocity zero, is thus possible. The measurement is carried out in such a manner that the single mode laser slowly moves through a range of wavelengths (attuned range). Whenever the resonance condition for the molecule which is at rest is fulfilled for an absorption line which lies in the attuned range, an intensity change of the probing beam is observed and spectral lines, of which the width is only still determined by the natural life of the corresponding transition, respectively by impact processes, are recorded in this manner. The line width of these nonlinear absorption signals can be smaller than the Doppler width by more than three orders of magnitude. The accuracy and resolution capability of the spectroscopic measurements therefore increase by the same factor.

This advantage of the nonlinear absorption spectroscopy immediately exposes the considerable significance which this process has for molecular physics. On the one hand, all molecular parameters which are of interest can be determined with considerably higher accuracy; on the other hand, the greater resolution allows the demonstration of previously unmeasurable splitting of molecular lines (for example, based on fine and hyper-fine structural effects). As an example, Figure 1 shows a section of a spectrum of BCl_3 , obtained in the Central Institute for Optics and Spectroscopy with the aid of a CO_2 laser, in the range of wavelengths around $10.6 \mu\text{m}$. For the purpose of comparison, the width of an absorption line is illustrated at the bottom ($\Delta\nu_D$), as measured in this spectral range by the use of conventional, linear absorption methods.

Using special, highly accurate systems, it was recently possible for Soviet and American researchers to demonstrate the splitting of the molecular line, which is in the order of magnitude of 2 kHz and which is caused by the recoil effect during the absorption, respectively the emission.

However, the high resolution capability of the saturation spectroscopy can also be used for the practical application for quite significant measurements -- for the qualitative and quantitative analysis of gas mixtures. As already indicated, the line density of molecules is so high, especially in the infrared spectral range, that linear spectroscopy can often no longer resolve separate lines for individual molecules, and especially not for a mixture of different molecules, but only provides a quasi-continuous absorption pattern.

Using the example of cyclohexane, this finding is demonstrated on page 7 of the December issue of SPEKTRUM of last year (12/76). The gas spectra of the linear and nonlinear absorption show a drastic increase in the information content in the case of the latter. A great number of separate characteristic absorption lines is observed. Conclusions can be drawn concerning the presence of one or the other component in the mixture from the spectral position of the absorption lines and about the corresponding concentrations from their intensity. Because of the high resolution, a very small attuned range of the laser frequency often proves to be sufficient in this case. Among others, this method was successfully tested in the Central Institute for Optics and Spectroscopy in the demonstration of certain isotope concentrations in a gas mixture. This suggests an application which might become significant for corresponding investigations in physics and chemistry.

The method of high resolution spectroscopy, which has been described so far is based on an indirect measurement of the saturation,

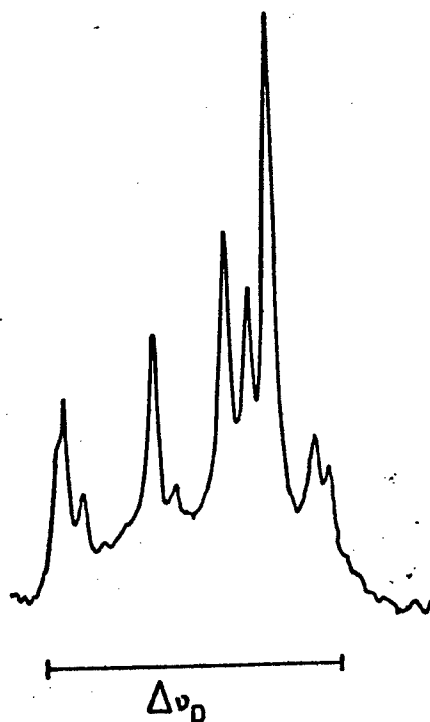


Figure 1. High Resolution Spectrum of BCl_3 in the Range of Wavelengths around $10.6 \mu\text{m}$. For the Purpose of Comparison, $\Delta\nu_D$ Demonstrates the Resolution Capability Attainable, as a Maximum, with the Linear Method

generated by the laser field with the aid of the probing beam. The nonlinear absorption can of course also be directly determined from the observation of the specimen transmission for a single intense laser beam. In this case, the possibility of a very high resolution of spectral lines does not apply; however, another method of saturation spectroscopy is derived, especially suitable for the investigation of molecules in solution. The measurement is carried out in such a manner that the transmission of the specimen which is to be investigated is observed as a function of the intensity of the incident laser radiation.

These transmission curves, also known as transition curves, have already played an important role in laser technology for a long time, because they are of fundamental significance for the function of dye transitions. The operating mode of these optical switches is based on the fact that the transmission of a color filter increases sharply above defined radiation densities, the

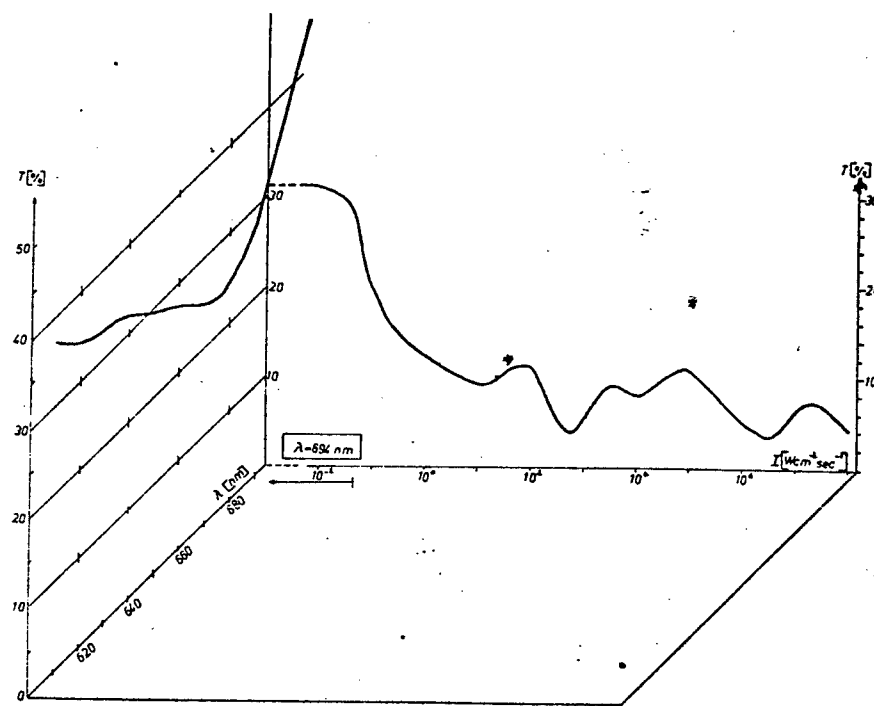


Figure 2. Intensity Dependence of the Transmission (Nonlinear Absorption) for $\lambda = 694$ nm for in vivo Chlorophyll; Sample Material: Wheatgerm leaves. As a reference (left), the wavelength dependence of the transmission (in the intensity range of conventional linear spectroscopy) \leftarrow intensity range of sunlight

filter thus becomes suddenly completely transparent for certain ranges of wavelengths.

It is now shown that, in many cases, the measured transmission curves are complicated in that not only an "opening" is observed, but also, with further increase in the laser intensity, a "closing", which is thus a reversal of the transmission. The explanation for this peculiar absorption behavior can be sought in the structure of the molecular system, as well as the environment which surrounds this system, for example the nature of the solvent. Thus, the absorption from an electron excitation state can occur as the cause for the renewed closing of a dye molecule, when a sufficient occupation of this state is effected by the intense laser radiation. The enrichment in these excitation states which, in turn, again cause an absorption of the incident laser wavelength, and thus prevent an additional increase in transmission, can follow the

primary process of the reduction of the quantity of molecules which is in the fundamental state and which initially leads to an increase in transmission. The final resulting degree of transmission can be calculated with the aid of balance equations, which can be established for a given time frame, so that the transmission curves can be theoretically simulated and can be adapted to those which are observed through the variation of parameters. As a result, information about life, transition probability and relaxation processes in electron excitation states, as well as about the association of absorption and fluorescent bands of a molecular system can be obtained through such an evaluation process.

The investigation of the transition behavior of in-vivo chlorophyll should be mentioned as an interesting example of an application. It is now being carried out in cooperation with the biology section of the Humboldt University in Berlin.

It is known that chlorophyll-a fulfills a double function in the process of photosynthesis: on the one hand, it is an essential component of the so-called molecular "antenna system", which absorbs sunlight and conducts it to the reaction centers of the photosynthesis with a high efficiency. On the other hand, chlorophyll-a (in a special configuration) itself is the principal component of these reaction centers, by whose photooxydation the electron transport of the photosynthesis is initiated.

Photosynthesis research is presently concentrating on the explanation of light-induced primary processes on in-vivo chlorophyll-a (intermediate stage of photooxidation). In this case, the method of non-linear absorption offers a qualitatively new approach in which, with nanosecond laser impulses and under in-vivo conditions, intensity-variable populations of the excitation states, which are relevant for the photosynthesis, can be obtained, and these, on their part, mirror themselves implicitly in the transmission which is measurable for the laser impulse. Because the time of the measurement is determined by the duration of the impulse (about 10^{-8} seconds), only the primary photo-processes in the chlorophyll, which are of interest, are separated from the totality of the photosynthesis processes (about 6×10^{-4} seconds per passage of the electron transport chain).

Figure 2 shows such an intensity-dependent transmission curve, measured on wheatgerm leaves at a wavelength $\lambda = 694$ nm. While, in the intensity range of conventional spectroscopy, the transmission amounts to about 30 percent (see spectrum in the left portion of the illustration), the transmission decreases with increasing intensity and, in its further pattern, evidences numerous local extremes, which each represent the population of a new

electron excitation state. The comparison with analogous measurements on extracted chlorophyll shows that the nonlinearities in the range between 10^{-2} and about 10^4 W/cm² are a characteristic of the in-vivo configuration. Especially the decrease in transmission, which already occurs in an intensity range which is comparable with sunlight, is an indication for two successive absorption processes, of which the effectiveness cross-section for the second (excitation state absorption) is even greater than for the first (fundamental state absorption). This nonlinearity in the intensity range of sunlight shows that it is probable that the in-vivo photooxidation is also a multiple photon process.

Additional, very effective techniques, for example the simulated Raman effects, the test radiation process, the time-resolving luminescence spectroscopy and many others can be added to the two described processes of nonlinear laser spectroscopy. The scientists and technicians of the Central Institute for Optics and Spectroscopy make internationally recognized contributions to the development of these new methods of analysis and carried out important investigations of applications, which represent an actual subject of discussion in special international conferences, especially in the Soviet Union.

For the further development and application of the methods of laser spectroscopy, we also expect new impulses and stimulations from the Dresden laser conference, in order to make it possible, with this work, to make a significant contribution to the further intensification of the research process.

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HUNGARY

BIOGRAPHIES OF NEW LEADING ACADEMICIANS

Budapest MAGYAR TUDOMANY in Hungarian No 11, 1976, No 1, 1977

[No 11, 1976 pp 688-695]

[Excerpts] Istvan Hermann was born in Budapest in 1925 and completed his studies at Lorand Eotvos University of Arts and Sciences [ELTE] in 1950. In 1969 he obtained the degree of Doctor of Philosophical Sciences with a dissertation entitled "Kant teleologiaja" [Kant's Teleology]. Presently he is university professor and director of the Faculty of Arts at ELTE. The field of his research is the history of modern philosophy and the history of classical German philosophy.

"Many are vulgarizing the correct idea of the satisfaction of social demand and the turning of science into a productive force." Janos Salanki was born in Debrecen in 1929. He received his diploma from the medical university in his home city in 1954. In 1970 he received the degree of Doctor of Biological Sciences with a dissertation entitled "The Regulation of Endogenous Rhythms." He is presently the director of the Biological Research Institute of the MTA [Hungarian Academy of Sciences] at Tihany. He is conducting research in the field of comparative physiology and neurobiology.

"Committees are not receiving a return signal regarding their proposals."

Sandor Simon was born in Szikszó in 1923. In 1951 he graduated from the Heavy Industry Technical University in Miskolc, where he is now the rector and directing university professor of the Department of Iron Smelting. He is conducting research in the field of iron smelting and is engaged in the study of the thermodynamics and reaction-kinetics of the processes of steel metallurgy. The work with which he obtained the title of Doctor of Technical Sciences in 1966 also belongs to this subject area: "Studies Toward the Discovery of the Thermodynamics and Reaction-kinetic Regularities of Sulphur Oxidation Occurring During the Manufacture of Oxygen Steel."

"It is our aspiration that the Ethnographical Committee formulate the tasks in prospect until the turn of the Millenium." Istvan Talasi was born in 1910 in Lasko Baranya Megye. He completed his university studies in the Faculty

of Arts at the Budapest University of Arts and Sciences in 1933. Presently he is professor in the Department of Material Ethnography in the same university. In his field of study, it is primarily material culture, the history of Hungarian ethnography and questions of the organization of knowledge that occupy him. In 1972 he received the degree of Doctor of Historical Sciences (Ethnography) for a dissertation entitled "Production and the Rationalization of Labor," and for his entire life's work.

[No 1, 1977, pp 30-38]

[Excerpts] Tibor Jermy was born in Locse in 1917. In 1940 he obtained the High School Teacher's Certificate from the Peter Pazmany University of Arts and Sciences in Budapest. In 1974 he obtained the degree of Doctor of Biological Sciences for a dissertation entitled "The Etiology of Food Specialization of Plant-Eating Insects." Presently he is director of the Research Institute of Plant Protection and is carrying out research in the fields of plant-protection zoology, experimental ecology and etiology.

Jozsef Lukacs was born in Budapest in 1922. He completed his university studies at the medical university. In 1971 he obtained the degree of Doctor of Philosophical Sciences with a dissertation entitled "Toward a Religious Typology of Antecedents of Christianity." Presently he is directing university professor of the Second Department of Philosophy in the Faculty of Arts at ELTE, and editor in chief of VILAGOSSAG. In his research work he is concerned with social philosophy and the theory of religion.

Mihaly Simai was born in Budapest in 1930. He finished his university studies at the Economics University in Budapest in 1952. On the basis of his work entitled "Structural Changes in the World Economy," he became a Doctor of Economic Sciences in 1971. He is deputy director of the MTA Research Institute of World Economy and a university professor. In his research he is primarily concerned with problems of general principle in international economic cooperation, the factors and mechanisms of "interdependence," and the prospects for world economic development.

Mihaly Stefan was born in Bodvaszilas in 1932. In 1954 he took his metallurgical engineering degree in the Faculty of Metallurgical Engineering at the Heavy Industry Technical University in Miskolc. In 1973 he became a Doctor of Technical Sciences with a dissertation entitled "The Micro-Alloying and Controlled Atomic Regulation of Soft Magnetic Materials." He is deputy technical managing director of the Csepel Iron and Metal Works. The field of his research is the theoretical and experimental investigation of structural changes occurring during the technological steps of material manufacture. His scientific achievements have been realized primarily in inventions, among which the following are the most significant: process for controlled crystallization of melted copper and copper alloys and for manufacture by intensive formation of bands or plates having isotropic mechanical properties, 1975; process for manufacture of a cold-rolled, cube-textured transformer band and plate, 1968 and a process for the manufacture of cold-rolled electrotechnical steel band and plate having isotopic magnetic properties, 1968.

HUNGARY

HUNGARY TO PURSUE RECOMBINANT DNA RESEARCH

[Editorial Report] Writing in the May 1977 issue of the Hungarian Academy of Sciences publication, MAGYAR TUDOMANY, pp 340-346, Pal Venetianer, doctor of biological sciences and team head at the Szeged Biological Center of the Academy writes: "Is it possible to arrive at an objective viewpoint in the debate about the pros and cons of recombinant DNA research? It is undoubtedly difficult because even the purely professional reasoning is based on hypothesis, prediction and not on fact. The writer of this article cannot claim the right to the role of objective judge, because, to quote the words of Chargaff, he, too, is one of the firebrands. At our laboratory in the Szeged Biological Center of the Hungarian Academy of Sciences we have already carried out the first domestic experiments in gene transplants and we intend to continue this work in the future."

CSO: 2502

HUNGARY

UTILIZATION OF HOLOGRAPHY FOR CHEMICAL INDUSTRY RESEARCH NOTED

Budapest MUSZAKI ELET in Hungarian 3 Jun 77 p 3

[Excerpts] Several institutions in Hungary concern themselves with the industrial uses of holography as well as with its theoretical aspects. It was in connection with the former that information was provided by Mrs Timko, Dr Judit Jozsa, head of the holography laboratory of the Technical Chemical Research Institute of the Hungarian Academy of Sciences. Jozsa is also head of the holographic group of the Optical, Acoustical and Film Technology Association.

According to Dr Jozsa, the Institute decided, in the early 70's to evolve a method which could be used in general for the holographic investigation of chemical industry operations. A ruby laser of enormous pulses was acquired. With the 5-10 MW output and 20-nanosecond flash laser, rapidly occurring processes can be recorded on surfaces coated with highly sensitive photo emulsion in the form of an interference picture.

On commission from the research institutes of various branches of industry, the Institute has made numerous investigations and arrived at new findings. In the case of spray discs, it was determined that the drop formation of Newtonian and non-Newtonian fluids is not identical. According to the pharmacologists it is important to know the particle size produced by high pressure jets at the moment of their formation, because this affects depth of penetration into the lungs. There is a similar problem in the case of environmental protection and work hygiene but for opposite indications.

CSO: 2502

HUNGARY

BRIEFS

ENVIRONMENTAL PROTECTION ENGINEERS--Since 1974 1,000 engineers have applied for training in the field of environmental protection. So far 201 of the 800 admitted have received diplomas. The training is being offered at five universities: University of Agricultural Sciences of Godollo, Budapest Technical University, the University of Forestry and Timber Industry, the Miskolc Technical University of Heavy Industry and the Veszprem Chemical Industry University. The students include a number of architects, physicians, geologists, biologists, chemists, agricultural and mechanical engineers and university instructors. The subject matter taught includes air pollution, protection of air purity, technical microbiology, control of water quality, protection from corrosion. At the Veszprem Chemical Industry University, examinations are given in 15 subjects. It is expected that nearly 160 students will graduate this year. [Budapest HETFOI HIREK in Hungarian 6 Jun 77 p 1]

INSTRUMENTS, COMPUTERS AT BUDAPEST FAIR--Comparison of Hungarian to foreign instruments is not easy. Whereas the former frequently measure up to the latter insofar as technical parameters are concerned, the trouble is that the Hungarian instruments tend to be three times as large as their Western counterparts. It is evident that of the Hungarian instrument enterprises MEDICOR, the Ganz Instrument Works, the MOM [Business Machine and Precision Mechanics Enterprise and the Hungarian Optical Works] continue to be in the best position for dealing with capitalist markets. This is due to the product structure they have developed. The four enterprises listed will account for over 60 percent of the 30 million dollar export plan for this year. This year MOM will sell geodetic instruments in the amount of 1.5 million dollars. The standard of Hungarian computer technology is no longer represented solely by the VIDEOTON Works. Since VIDEOTON sees the most promising future in the mechanization of management, it has developed the VT-50 line which in addition to a VT-1005 central processing unit, consists of a rapid store magnetic disc and two data recording cassettes. The price of the basic configuration is more than three million forints. It has two socialist competitors: the East German Daro 1720 and the Polish Mera 305. The VILATI [Electrical Automation Institute] produces the TPA-70. This year 11 such computers will be produced and the development section is working on additional software programs. A TPA computer is a component of the diagnostic apparatus of the GAMMA Works. [Budapest VILAGGAZDASAG in Hungarian 26 May 77 p 3]

LASER ASSISTED COLOR PICTURE REPRODUCER--At the end of 1976 the Hungarian printing industry acquired the technology for breaking down color electronically with the aid of a laser beam. The DC 300 installation purchased from the Hell firm of Kiel was installed at the Kossuth Press. It cost more than 10 million forints. The device scans the picture to be reproduced by sections after having broken it down into dots. In this way the ratio in which yellow, magenta and cyan are mixed in the individual dots is determined. Electronic instruments forward the findings in the form of electric signals to the writing head which puts the points together on the basis of this and causes the picture to appear on film either in original size or enlarged, with the aid of a laser beam. The complex process is controlled by a computer. The results produced by the DC-300 are far truer to the original both in color and detail than could be produced by traditional equipment. This is the only equipment of its kind in the country. [Budapest ESTI HIRLAP in Hungarian 21 May 77 p 3]

CSO: 2502

HEART DISEASE AND PACEMAKERS DISCUSSED

Warsaw CZAS in Polish No 38,19 Sep 76 pp 3, 6, 7

[Article by Tadeusz Bolduan: "The Harassed Heart"]

[Text] Physicians estimate that a person who has smoked a pack of cigarettes a day for 20 years has a four times greater possibility of suffering a myocardial infarction than a nonsmoker. American researchers have collected statistical material from which it follows that the average increase of mortality from a coronary disease in males smoking one pack of cigarettes a day, as compared with nonsmokers, amounts to about 70 percent. This does not concern the smokers of cigars and pipes if they do not inhale the smoke. The connection of smoking with heart diseases is also less observable in females.

The smokers derive a rather doubtful reassurance from the fact that dependence of heart diseases upon the smoking of tobacco has not been established. It is true that the observation of patients and statistics point to such a dependence but as in many other diseases, it was not possible to prove this irrefutably, whereas cigarettes are one of the factors that predispose to heart diseases.

One connects, as a rule, heart disease with a sudden and often unexpected infarct which frightens anyone who experiences some discomfort in the chest, for example, pains in the form of angina pectoris. Meanwhile the infarct is only a dramatic instance of a heart disease and especially most frequently of the coronary disease caused by the atheromatous degeneration of coronary arteries. It is dramatic, since 80 percent of sudden deaths occur due to heart disease caused by the infarct.

There is a widespread opinion that man can survive three infarcts, whereas the fourth one means conclusively death for him. This is an erroneous opinion since all infarcts are not the same. The most important is the cause which has brought about an infarct. There may be only one infarct, after which the patient, who follows in an orderly way the instructions of physicians, returns to a normal or almost normal way of life. Obviously there are some who perish in the first infarct, but there are also there who survive several infarcts and work normally. There are situations, though rare, where an infarct was

caused in a young person by the inflammation of the intima of the coronary artery. From clinical experience it follows that the most dangerous one is the first infarct. Not infrequently young people die from it. In the case of coronary vessels, the gravity of infarct is estimated according to the number of branches affected by atheromatous changes. The greater the number of affected branches, the graver the cause of disease.

What is an infarct? It is a sudden exclusion of a certain region of the heart from its normal function and, during the ischemia, it brings about disorders of the heart rhythm. A considerable number of patients die during the first two hours of the infarct, among other things due to the lack of immediate help. In no country has it been possible so far to organize such a health service that the patient would be in a hospital sooner than, on the average, 6 hours from the moment of the appearance of the manifestations of the infarct. Hence, there is a need of the ability of rendering first aid to the patient of by all concerned.

When the patient is in a hospital, he is still in danger of death for 2-3 days due to the rhythm disorders. The present intensive cardiological care wards decrease this risk, for they permit a constant observation of the patient.

A Social Calamity

Among heart diseases (arterial hypertension, congenital defects, aggravation of the heart by diseases of the respiratory system), the most frequent is coronary disease, which has been rightly called a social calamity. It is the main cause of death in the United States and Europe. Due to it in the United States over 500,000 persons die annually, that is, it amounts to one-third of all deaths. It is similarly in Europe where the incidence of coronary disease in the age group of 35-55 amounts to 1-1.5 percent. The same index is noted in Poland; heart diseases and diseases of the circulatory system are responsible in Poland for one-third of all deaths and for as much as 10 percent of the absenteeism due to illness.

The future outlook is outright frightening. According to the prognoses worked out at the request of the Commission of Health of the Committee for Research and Prognoses of the Polish Academy of Sciences, if the upward tendency of diseases of the respiratory system and coronary disease is maintained, then in the year 2000 about 70 percent of the deaths would be caused by heart diseases.

Atheromatosis is a disease whose process is very complex, consisting of the deposition of lipids in the intima of large arteries, leading to a development of connective tissue which causes hardening of the arteries. Changes occurring in the arteries considerably narrow their lumen up to its complete occlusion obstructing completely the inflow of blood to the tissues of the cardiac muscle and the cells of the brain. Atheromatous changes develop most frequently in the coronary arteries of the heart, brain, and kidneys.

Atheromatosis develops gradually, already at a young age, but its clinical symptoms appear rather late, more or less at the 40th year of life and more often in males than in females. Only after the 70th year of life the proportion is equalized in both groups. Physicians readily quote American statistics from the Korean War. During autopsies of the young killed in action in this war, averaging 22-years old soldiers, in 70 percent of them atheromatous changes were ascertained in the coronary arteries, that is beginnings of the coronary disease, of which they were obviously unaware.

The causes of the occurrence of atheromatosis are not known and therefore the attempts to check its development are of little effect. The intervention of a physician in critical situations, especially that of a surgeon, may temporarily eliminate dramatic causes of atheromatosis and avert for the time being its consequences, whereas it cannot check the process of the development of the disease. Thus the problem boils down to prophylaxis.

The Sinister Cholesterol

The coronary disease and its complications are favored by such principal factors as heredity, age, and sex, hypertension, and metabolic influences (diabetes, thyroid insufficiency, increased level of uric acid in the blood), improper diet, obesity, smoking cigarettes, and stress caused, among other things, by the occupation practiced.

One of the professors of the Gdansk Academy of Medicine has said frankly that cholesterol is being always accused of being conducive to the occurrence of atheromatosis and its consequences, since nothing better has been discovered. Cholesterol is being accused all over the world, on the basis of the statistical results of investigations which indicate a close connection of it with the frequency of the occurrence of coronary disease.

Thus cholesterol, a structural component of the cell, classed among complex fats, that is, steroids, predisposes to coronary disease. The main source of cholesterol are animal fats, egg yolks, and sugar. At the same time, one must remember that the liver, as well as other cells of the organism, is capable of producing considerable quantities of cholesterol. The excessive consumption of animal fats and sugar raises the level of cholesterol in the blood and thereby predisposes to atheromatosis. The correct level of cholesterol in the blood is 150-200 milligrams in 100 milliliters.

According to American and West German physicians, man should arrange a diet for himself in such a way that his daily nourishment would contain at the utmost 300-350 milligrams of cholesterol. It is worth, therefore, as an example, to remember, that, taking as a basis 100 grams of food product, pork contains 70 milligrams of cholesterol, veal-90, game-110, pork liver-360, veal liver-420, brains-3,100(!), chicken-75, caviar-300, butter-280, lard-100, ice cream-45, chicken yolk-1,400. The cholesterol content of milk with 3.5 percent of fat and cheese and cottage cheese with small fat content is very small. Products such as vegetable margarine and chicken egg white have no cholesterol at all.

West German scientists have worked out five dietetic principles by which all those who have an elevated level of cholesterol in the blood, or in any other way are susceptible to coronary diseases should be guided:

--One should observe the normal body weight. The ideal weight is equal to height in centimeters minus 110. For example, a person 175 centimeters tall should weigh 65 kilograms.

--To limit the consumption of fats, especially those contained in meat, sausages, milk, and pastries.

--To limit oneself to consume less than 300 milligrams of cholesterol daily, which is the amount contained in one egg.

--To consume more vegetable fats and sunflower oil.

--To give up animal fats and butter in favor of margarine, lean and low-fat cheeses and cottage cheese.

West German physicians from Bad Krozingen and Heidelberg have devised a model diet for post infarction patients which may be also used for other persons affected with various heart diseases. They should not consume daily more than 2,600 calories, including the required amount of protein and the limitation of the intake of carbohydrates. One of the variants of the diet of 2,100 calories envisages for breakfast one and one half rolls, 20 grams of margarine, 50 grams of lean cottage cheese, 30 grams of lean sausage, tea or coffee without sugar. For midmorning snack, 200 grams of fruit. For lunch a steak or chop (150 grams) broiled or fried in sunflower oil, 200 grams of potatoes plus vegetables or salad with vegetable oil. An afternoon snack should consist of 1 slice of bread and 30 grams of low-fat cheese or lean sausage. For dinner one should have 150 grams of fish and 100 grams of potatoes with melted margarine. With regard to diets, individually designed, one should always consult physicians.

We Don't Know How To Live

The longer man lives, the more he worsens the conditions of his life and as a result he kills his organism himself. In the highly developed countries, heart diseases constitute the greatest epidemic of our times and decidedly surpass the neoplastigenic diseases. It is an outright tragedy that affected with it are young people in the so-called productive age.

We know how to eat abundantly and richly, but we don't know how to live and we facilitate for atheromatosis its victorious march in our organisms. Our means, reminiscent of feasts, our irregular way of life, stresses, improper distribution of work and rest, pollution of environment, lack of rational physical education, and excessive smoking--all this favors heart diseases. But no one listens when physicians say: Stop! Observe moderation!

Meanwhile, the physicians' slogan: to eat little, to work much, to sleep little, even if we reject the extremes, contains much truth. A man who is moderately active, hard working, observes moderation in eating, and properly correlates work with rest is less susceptible to heart diseases and enjoys better comfort and general health.

Think how many corpulent persons there are in this world who only wait for the occasion to eat and drink well. Although alcohol is not considered a factor of risk in coronary disease, still while it is being consumed it is accompanied by a snack, the fatter the better, and this is harmful to health. Obesity, caused by excessive eating and improper life style, (lack of movement, laziness), is a serious factor of risk in coronary disease, since there is a connection between obesity and hypertension. It is true that obesity does not lead to hypertension but--according to American physicians--hypertension is present in about 60 percent of obese people.

Another risk factor, very vital, is the kind of occupation and work environment. Coronary disease most often occurs in those people who lead a sedentary mode of life and their professional work is connected with responsibility which causes mental tension and results in stresses. In the West we observe, for example, the fear of losing one's job, or fear of a boss whose decisions affect the fate of the employee, whereas in Poland, one is not infrequently faced with an inappropriate coordination of work and the resulting disorder which compels employees to resort to hasty, nervous interventions, or one is confronted with difficulties created by bureaucracy in dealing with the simplest matters, and thousands of petty daily worries, including family-related ones. Causes that keep us in the state of nervousness and constant excitement are sufficiently numerous.

Ambitious people, who are very active and who react strongly to the inappropriatenesses of life, who endeavor to accomplish too much within a short period of time, are affected more often by coronary diseases than those who solve quietly even the most important and urgent problems and...who do not expect too much of life. Thus it is the very character of man and his reactions that also contains the factor of disease risk.

The Saving of Lives

We set our hopes on the transplantation of hearts. The majority of physicians are sceptical about this procedure and tend to see a promise in an artificial, mechanical heart. Since 1974, the Soviet and American scientists have been carrying on jointly, and so far with good results, the work on the creation of a heart prosthesis. Nevertheless, the artificial heart is still a problem of the distant future.

At present, the pacemakers, miniature devices with autonomic power supply sources, represent important progress in medicine. They have saved the lives of many. Over 2,000 of them have been implanted in Poland and over 3,000 in the Soviet Union. The implantation of these devices, not to count sporadic cases, is not a curative procedure; these artificial stimulators,

however, permit a technical circumvention of the heart action in connection with various morbid processes. Atheromatosis occupies one of the first places among these processes. Thanks to pacemakers, a large group of people were saved and continue to live. For how long were they saved? That depends on the cause of the illness. If the patient has arrhythmias because of atheromatosis which steadily progresses, then after some time it will reappear in some other place. But there are young people who, after a single inflammatory illness, would perish if the scar after the illness were located in the conductive system of the heart. It would stop the heart and cause death. Thanks to a pacemaker, the patient is saved and even returns to a normal life.

In connection with heart pacemakers, a new problem arises, or, as physicians define it, a new pathology. A patient with an implanted pacemaker must be under constant medical supervision and must submit to certain limitations in life style; for instance, he cannot approach various electrical machines. From time to time, he must visit the clinic for an examination, and every 2 years the power supply source must be replaced. At the same time, the number of new candidates for pacemaker implantation is growing. This is an organizational problem, among other things, the problem of the number of hospital beds.

Scientists are constantly working to improve pacemakers. In the Soviet Union in 1969, a model of a radioisotopic pacemaker using plutonium-238, which can function at least 10 years, was developed. The use of new stimulators permitted the simplification of the technique of surgery. It was found that the electrode can be connected with the heart through the veins without opening the thorax of the patient. Such an operation is performed under local anesthesia.

Organization - The Half-Way Mark

Important changes have taken place in the organization of the Polish Health Service. Cardiology, as a separate specialty, has been separated from internal medicine from the scientific and medico-organizational viewpoint. The Polish Cardiological Society functions actively, National Cardiological Inspection was made a separate unit, and a National Consultant for Cardiology and Voivodship Specialists was created. We have specialized cardiological clinics and specialized units in hospitals, and also resuscitation ambulances.

However, not all has yet been done in the organization of cardiology. Cardiological clinics continue still to be de facto clinics of internal diseases, rendering general internist services. The creation of further hospital units specializing only in cardiology remains still a matter of the future, since this is connected with the building of new hospitals, the training of a cardiologist cadre, and the providing of equipment. The organization of voivodship outpatient cardiology and postinfarction rehabilitation dispensaries needs to be carried out. Up to now, do not have cardiological dispensaries

in all the towns in the voivodships for the simple reason that there is a lack of specialists, premises, and costly equipment. We have done much in this field, but still more remains to be done.

American scientists, headed by Dr David H. Blankenhorn, are conducting experiments to develop a method which would permit earlier detection of the processes of progressive coronary disease. Dr Thomas Holmes from the University of Washington is analyzing the effect of stress on heart disease (which is contradicted, for example, by Swedish scientists), and various tests are being conducted by European, including Polish, scientists. As in the case of neoplastigenic diseases, the fight against heart disease was raised in many countries to the rank of a government program.

Since the sources of cardiovascular diseases should be sought in the adolescent ages (12-18 years), in the Soviet Union compulsory examinations are being conducted for their detection; prophylaxis being the most important. The best physicians and the best organized health service will not accomplish what can be achieved by society itself if it will learn to live wisely.

PHOTO CAPTIONS

1. p 3. Implantation of pacemaker.
2. p 6. The operating physician inserts a pulse generator into the opening under the right pectoral muscle. Above--an electrode is being introduced in the superior vena cava.
3. p 6. Pulse generator--a part of the pacemaker.
- 4&5. p 6. Two methods of implanting pacemaker. The first--more frequently applied--consists in implanting the pacemaker below the right pectoral muscle. The electrode--an insulated, elastic wire with platinum tip--is introduced through the cervical vein in the right apex of the ventricle of the heart where it is secured. Second method consists in placing the stimulating electrodes on the cardiac muscle itself and the pulse generator directly behind the abdominal muscles.

1015

CSO: 2602

POLAND

DEVELOPMENT OF MOLECULAR BIOLOGY OUTLINED

Warsaw NAUKA POLSKA in Polish No 3, Mar 76 pp 3-13

[Article by Wlodzimierz Ostrowski, corresponding member of PAN:
"Molecular Biology -- Development and Tasks in Polish Science"*]

[Text] Biological sciences have always played a significant role in the development of life and social awareness. One of the fundamentals of contemporary progressive philosophy has been the theory of the evolution of species, which aroused and gave new impetus to the development of biological studies in the 19th century. Molecular biology fulfills an analogous integrating function in the second half of the 20th century. It considers living phenomena at their basic molecular level and, for the first time in the history of science, forms an internally compact picture of the structure and functions of a living cell, as the clear result of physical and chemical laws. Expanding the horizons of knowledge, molecular biology affects the contemporary world outlook of man in an essential way, and at the same time provides a number of concrete socioeconomic advantages. From these viewpoints the due organization of activity in the area of molecular biology and the proper development of its research directions have currently become the object of special care in the majority of developed countries.

Molecular biology, developing with special dynamics for about 20 years, was sprouted by biochemistry and biophysics. It is a new method of approaching biological problems in which the essential properties of living phenomena are considered as the result of complex reactions between the chemical components characteristic of living creatures. Making use of physical and chemical laws in explaining complex living processes, molecular biology still does not at all lose track of the biological background against which these physicochemical processes occur. For this reason contemporary molecular biology is something more than an application of chemical and

*The report was given in the name of the Committee for Biochemistry and Biophysics at the meeting of the PAN Science Secretariat on 3 June 1975 by Prof Dr W. Ostrowski, chairman of the committee.

physical laws to the problems of biology, medicine and agriculture. Its main task is to discover, and then to mimic and recreate the essential and unusually complex phenomena characteristic only of living material originating solely in organisms and in various biological systems.

Molecular biology owes its dynamic development to the fact that it makes complete use of the experimental techniques and concepts of all exact and biological sciences. Here the concrete social conditions which evolved in the world in the first half of our century came to the rescue. As a result of the spread of new forms of production, new branches of industry developed associated with agriculture, food production, production of medicines, biocatalysis and so forth. These new technologies require efficient and repeatable control of chemico-biological processes, as well as of manufactured products. Care for better work productivity and human health, increased from economic and military points of view, required the general use of biochemistry as a basic discipline enabling more effective satisfaction of the needs of medicine and agriculture. Development of new technologies then made it possible to construct special equipment enlarging the area of research on macromolecular compounds and biological structures. Here we should mention the ultracentrifuge, in which the rotational fields developed exceed the attraction of the earth by several hundred thousands of times, making it possible to investigate the hydrodynamic properties of proteins, nucleic acids, viruses and other biological structures. In turn, putting the electron microscope into the hands of morphologists and biochemists has made it possible to fill the gap between the regular optical microscope and the distances established in particles by interatomic attraction. This fact has made it possible to penetrate more deeply into the organization of living material and to establish the fact that every biological process is a complex of chemical reactions and physical phenomena, but in a definite morphological structure. The implementation of the atomic pile during World War II, among other things, made a broad access to radiation-producing isotopes and the production of the most varied kinds of desired compounds possible. This made it possible to direct metabolic research in a previously unheard of area in the living organism. Finally the development of the electronic industry in recent years led to the construction of counting and automated equipment used at present to investigate the structure of macromolecular compounds, the mechanism of their activity and the modeling of very complex biological systems, the study of which will undoubtedly produce new practical developments. In view of the need to use the very complex apparatus currently found mainly in the hands of chemists, physicists and technicians, molecular biology today has become the most expensive of the experimental sciences and at the same time requires the training of highly qualified cadres of specialists. Therefore we must clearly realize that this field cannot be cultivated in isolation, but only in large research units applying various kinds of techniques and efficient organization in carrying out established plans.

So far the major achievement of molecular biology has been to explain the physicochemical basis for the inheritance of features and the biosynthesis of protein in the cell, determined as a reading of the genetic code. This discovery, with its far-reaching cognitive implications, has become the point of view for the rapid development of many research directions in biology, chemistry, physics and mathematics. It has made it possible to identify the basic mechanisms in the transmission of genetic information and in programming the structure and functions of cells. Research on protein has revealed many structural features at the submolecular level responsible for the special interaction of protein with its environment, which is of substantial importance for understanding the high efficiency and specific features of biological catalysis, the probability of the course of chemical changes in cells and their ability to react to chemical and physical stimuli. Combination of the results of this research with many other achievements has led to studies on biologically important supermolecular structures, explaining the mechanisms of regulation in the activity of the genetic apparatus and forming bases for a knowledge of the structure and functions of biological membranes, the agent integrating the cell and conditioning the proper cooperation of billions of cells in higher organisms. The direct link between the cognitive and applied aspects of biological studies has always lain at the source of their high usefulness in solving current medical and agricultural needs. In the current era with its rapidly growing density of population, new tasks, more difficult and carrying more responsibility, face the biological sciences. Traditional means of food production are approaching the highest limit of their capabilities, limited by the low productivity of photosynthesis and assimilation of nitrogen in naturally occurring species of plants and their hybrids. Degenerative, tumorous and psychic diseases affect the health of mankind and man's ability to perform work to a greater and greater degree, diseases for which the treatment and prophylactic methods known at present are not very effective and, in many cases, useless. The constant and indispensable expansion of industry, particularly the heavy and chemical industries, represents a threat to man's natural environment, which the technological measures used today are not able to counteract. A special role in the solution of these problems falls to molecular biology, because of its extensive integrational functions and close connections with many disciplines in the natural and technological sciences. Even today the many practical successes of molecular biology are quickly utilized in the economy of many developed countries. There are even new separate branches of this discipline, for example, biological engineering, well-known to people, with two directions, genetic engineering and enzymatic engineering.

The process of drawing the bonds closer between molecular biology and technology will undoubtedly become stronger in the coming years. However, this is dependent upon the harmonious development of various biological disciplines and on due recognition by technology of the importance which modeling productive processes on the basis of physical and chemical mechanisms elaborated by nature during the long period of evolution of living beings can have for the social economy.

Development and current state of biochemistry and molecular biology in Poland. Polish biochemistry has a tradition over 100 years old. Chairs of Medical Chemistry for giving lectures and lessons in the area of "the chemistry of living phenomena," mainly the processes of digestion, respiration and transport of materials, were founded in the Main School in Warsaw in 1864 and in the Jagiellonian University in 1865 within the framework of the medical faculties. It should be recalled that the above-mentioned teaching and research posts were the first in Europe and were formed at least 10 years before similar posts in the universities of Western Europe. At the end of the 19th century outstanding Poles were also carrying out biochemical research outside the borders of the country. First among them were Marcelli Nencki, first working in Berne and then in Petersburg, and Leon Marchlewski, initially working in Manchester and from 1900 on in Krakow. Both scholars made a tremendous contribution to the biochemistry of the world, thanks to their research on hemoglobin and chlorophyll, and also trained cadres of successors who occupied university posts in the country after independence was attained in 1918. Thanks to this Polish biochemistry maintained a relatively high level in the years between the wars, and some of its research achieved worldwide reknown. In Lwow J. K. Parnas elaborated for the first time in the world isotopic methods for investigating the metabolism of phosphorus compounds in muscles, establishing some reactions of the so-called glycolytic cycle. In Warsaw S. Przylecki carried out research on large particle substances, mainly on complexes of protein with other compounds. In Krakow L. Marchlewski continued studying the structure of chlorophyll and the spectral properties of biologically active organic compounds.

After World War II, despite the enormous losses which the country suffered in this field also, biochemistry in Poland began to develop quite rapidly. Keen interest in the dynamically developing directions of biochemical research, opening up new prospects in medicine, agriculture and industry, brought about the establishment in a relatively short period of time in all university centers within the country of posts carrying out intensive research in the area of biochemistry, biophysics and molecular biology. During the past 30 years the number of cadres of specialists has increased, and in several centers well-organized, although not always the best equipped, posts and research teams have come into being, carrying out research which is also included outside the borders of Poland. The main biochemical posts, clearly specialized, are currently: the Institute of Biochemistry and Biophysics of the Polish Academy of Sciences and the M. Nencki Institute of Experimental Biology of the Polish Academy of Sciences in Warsaw; the Institute of Biochemistry and Biophysics of the Academy of Medicine and the Ludwik Hirszfeld Institute of Immunology and Experimental Therapy of the Polish Academy of Sciences in Wroclaw; the Intercollegiate Institute of Biochemistry and the Department of Stereochemistry and Natural Products of the Polish Academy of Sciences in Poznan; the Institute of Medical Biochemistry of the Academy of Medicine and the Institute of Molecular Biology of the Jagiellonian University in Krakow; the Department of Biochemistry of the Institute of Medical Biology of the Academy of Medicine in Gdansk; and

the Department of Tumorous Biology in the Institute of Oncology in Gliwice. The departments of biochemistry, microbiology and chemistry in the medical academies and universities in Warsaw, Wroclaw, Gdansk, Poznan, Lublin, Lodz, Krakow and Bialystok also achieved a high position within molecular biology and biochemistry. Among the special achievements of Polish biochemistry we may mention: enzymological research with the crystallization of several enzymatic proteins, research in the area of molecular genetics and protein biosynthesis, research on the structure of nucleic acids in plants and in synthetically obtained acids, on the structure of muscle protein, on antibodies and on the mechanism of energy transport in cells.

The system of coordinating research plans within the framework of critical and ministerial problems, worked on for 5 years, has given particular impetus to biological and molecular research in Poland. First of all there has been considerable integration of the scientific potential of PAN [Polish Academy of Sciences] posts, of university posts and of ministerial institutes. During this period the cadres of specialists in individual biochemical disciplines rose from 5 percent to 25 percent. Lively cooperation was also developed in the problem of "molecular biology", coordinated by the academies of sciences of the socialist countries. Molecular genetics, with its investigations of the structure of nucleic acids and their components, of protein biosynthesis, of the structure of the gene and regulation of its functions, has developed particularly well during the past 5-year period because of the new forms of organization. Many valuable results, holding a permanent place in science, have been achieved in research on autonomic factors of inheritance and their construction, and many correlations between the transmission of information and the physiological state of partners engaged in this process have been clarified. Some nucleic acids transporting amino acids to the synthesizing apparatus of protein in plants and in bacterial viruses were isolated. New data have been obtained about interactions conditioning the spatial structure of nucleic acids and new nucleic acids and their components, not found in nature, have been synthesized. All of these results, as well as many similar ones not mentioned here, constitute testimony to the dynamic development of Polish molecular genetics.

In planning the future development of molecular biology it is also necessary to indicate the research directions and developmental tendencies which are acquiring more and more importance now on the world level and have not been duly developed in Poland. The subject of research in national laboratories is almost exclusively the genetic apparatus of small organisms and some bacterial viruses. On the other hand for a number of years molecular genetics throughout the world has been engaged to a greater and greater degree in the investigation of the genetic apparatus of animals and animal viruses. This is significant progress, to a large extent resulting from the rapid development of technology in breeding cells and tissues, which have made it possible to transfer molecular genetics from a rather simple, distant model to a more complicated system, more advanced in evolution and directly associated with the most important problems of human biology. In Poland in

basic research on the structure of the genetic apparatus so far greater stress has been placed on nucleic acids than on protein. Outside of past programs of coordinated research, there remain such problems as repair and restrictive enzymes, not much work has been done on polymerases and no research has been undertaken on so-called reverse transcription. These unusual directions have been abundantly developed in recent years throughout the world, in view of the importance which they have for a knowledge of the mechanisms of differentiation, tumorous transformation, somatic mutations, and the processes of aging and degeneration, as well as in the diagnostics of tumors and some genetically conditioned diseases. There is no doubt that research on these enzymes will continue for a number of years to be one of the most important currents of contemporary molecular genetics and of biochemistry as a whole.

Another basic subject of research, along with molecular genetics and studies on nucleic acids, is protein. This subject as a whole was not included in any of the critical or ministerial problems of past years, and therefore progress in this area was relatively smaller. Nevertheless within the framework of some ministerial research, valuable results have been achieved in recognizing the structure and functions of muscle and antibody proteins. Work on enzymes, traditionally well developed in Poland, was conducted mainly on the basis of a subsidy from the PAN Committee of Biochemistry and Biophysics and, despite the fact that financial means were rather scanty, great results were achieved forming a permanent position in world science, particularly in research on the structure and functions of enzymes in subunit structures, such as aldolase, phosphatase, protease, arginase, oxidase and others. Some of these results have become the basis for patented methods of production, enzyme preparations used in medical diagnostics, blood-derivative medicines and so forth. However, in general the state of research on protein in Poland deviates considerably in its area and opportunities from the needs, the personal interest of researchers and the current development in the world. It should be stated that there is not even one laboratory in the country completely specializing in research on proteins, and there do not even exist technical possibilities of investigating sequences of amino acids and protein conformation outside of a very limited area. On the other hand, in other countries research on proteins is developing very dynamically, with a great deal of emphasis being laid on the application of physical and chemical methods, elaborated among other ways through solid state physics, as well as on the construction of a theoretical approach to the molecular structure of protein. Studies on the role of metal in model biological systems are part of the particularly developed research in the world. Models have been worked out for a number of metallo-enzymes, mainly taking part in the transport of electrons in the cells of bacteria, plants and animals, and usually associated with processes of intracellular respiration.

Work has been systematically developed in Poland on the third of the basic goals of molecular biology, that is, on molecular superstructures. Significant results have been achieved in several centers in investigating the chromatin of regular and tumorous animal cells. Research on biological membranes, both in their model and theoretical aspect and in their association with bioenergetic processes and cell contractability have permanent value in the world literature. However, possibilities for experimentation are limited, similar to those which hinder the development of research on protein, and do not permit dealing with a subject which has become dominant in this field in recent years, that is, the structure and function of chemical signal receptors and the connection between the function of the cell membrane and the replication and transcription apparatus of the cell.

Unequal development of individual directions of research in molecular biology has hindered the degree of progress in a number of traditional disciplines in biology and medicine. The Second Polish Science Congress called attention to these matters. Stressing the importance of molecular biology in solving problems of medicine and agriculture relating to food and health protection, a resolution of the Second Science Congress postulated the need for developing virology, microbiology, physiology, pathophysiology and endocrinology in higher organisms. In our opinion experimental oncology, neurochemistry, the molecular genetics of plants and higher animals and immunochemistry should also be developed faster than in the past.

The role of molecular biology in solving government and focal problems in the coming 5-year period. In the system of coordinated research for the next 5-year period, problems of molecular biology were included in government, focal and inter-ministerial problems aiming, among other things, at mastering tumorous diseases, the production of a protein mass and explanation of the molecular basis of the living processes in tiny organisms and in higher organisms. In addition the concepts and methods of molecular biology will play a significant role in other government and focal problems.

In the program of countering tumorous diseases, research will be carried out on the structure of the oncogene, as one of the central problems of modern oncology with tremendous cognitive and practical consequences, among others, for early determination of tumorous risk and designing a synthesis of anti-tumor medicines. In the program devoted to investigation of evolutionary processes, identification of structural changes in homologous genes is currently one of the best methods of evaluating evolutionary distance. In the program of using immunological differences in organisms, counting the number and identifying the genes of antibodies and genes of tissue concordance are of primary importance in breaking the immunological barrier in transplants and in activating the defensive mechanisms of an organ itself against tumorous growth. In research on intensification of the production of nutritious and feed materials, the separation of genes responsible for photosynthesis and nitrogen assimilation will be a critical stage in the development of genetic engineering and will essentially increase the productivity of these processes.

No less numerous will be inter-problem relationships in reference to research on proteins. The problems involved in isolating pure proteins and determining their characteristic features occur in all modern systems of selection of animals for breeding, methods of producing food protein, identification of pathologically changed cells and organs in tumorous diseases, and diseases of the nervous system, in immunology and so on. However, research on protein structure is not only important for problems directly aimed at a solution of the questions of food and health protection of mankind. Identification of the atomic configuration and then a synthesis of a model of metallo-enzymes, responsible for the catalytic properties of many enzymes, are currently becoming a particularly valuable way to obtain technological biocatalysts. Examples here can be recent achievements in the field of methods of combining carbondioxide and atmospheric nitrogen, numerous biochemical technologies based on the use of low-pressure and low-temperature insoluble biological catalysts with a definite superiority over low yield, purely chemical, energy-producing processes. This direct use of natural enzymes, particularly in the form of enzymatic reactors, is currently providing great service in technology by streamlining and improving methods of producing various organic compounds, such as vitamins, antibiotics and various food products.

The question of cell membranes, which will be concentrated in its cognitive aspect on the focal problem of research on basic cell functions and sensitivity of organisms, will also play an essential role in other problems of the current new research program, and particularly in those problems which embrace research on the nervous system, on immunology and on fighting tumorous diseases. They are also of great importance for designing selectively semipermeable membranes, used more and more in various technological processes, such as in water purification.

Thus in many focal areas problems typical of molecular biology will arise, but associated in a different research context and for other experimental systems. This is a natural result of the integrating function of molecular biology in relation to other biological sciences and its close relationships with the exact sciences.

Special aid in solving government and focal problems, in which molecular biology methods will play a basic role, is to be expected from those laboratories of organic and physical chemistry which currently have a seasoned cadre of workers and excellent apparatus support. These laboratories are: the Center of Molecular and Macromolecular Research of the Polish Academy of Sciences in Lodz, the Institute of Chemistry of the University of Wroclaw, the Department of Catalysis and Surface Physico-Chemistry of the Polish Academy of Sciences in Krakow, the Institute of Molecular Physics and the Department of Stereochemistry of Natural Products of the Institute of Organic Chemistry of the Polish Academy of Sciences in Poznan. The current subject of research at the above-mentioned laboratories is associated with those problems which molecular biology is dealing with at present. The coordinating system for focal problems is the proper

vertical contact system for an area of scientific and technological revolution. Therefore in it molecular biology should constitute a system of horizontal connections on the performance plane, in this way guaranteeing proper versatility in solving research tasks and high work efficiency.

The nature of molecular biology and an analysis of its present state in Poland show that scientific departments located in all university centers in the country should expediently become humming centers of molecular biology, while maintaining their own differentiation in scientific interests and with due specialization. The multiplicity of future tasks in connection with current and anticipated specialization in various centers requires the inclusion in the plan of all university sites and posts of PAN scientific research institutes, as well as those of particular ministries.

Here we wish to stress emphatically that only in such a system will molecular biology be able to fulfill its basic function in the solution of tasks entrusted to it within the framework of government and focal problems. It can then be expected that the development of molecular biology in these centers will become the unique factor of environmental integration, leading to greater intellectual cooperation and streamlined use of technological methods of conducting experiments.

Needs in the area of construction investments. Practical considerations tend toward dividing the maximum investment program into two stages. In the first stage, embracing the years 1976-1980, definite priority should be given to the development of several of the centers mentioned above, which have made a major contribution to the achievements of molecular biology in Poland under current conditions. In the course of the next few years these centers will mainly solve research problems within the framework of an established program of government and focal research, as well as prepare cadres for accepting new tasks in subsequent five-year periods.

The following centers should be given priority:

1. Warsaw -- with specialization in the area of molecular genetics, virology, neurobiology, oncology and experimental endocrinology, cell regulation, and the raising of cells and tissues.
2. Poznan -- with specialization in the area of protein biosynthesis in higher plants, research on the structure of nucleic acids and the pathophysiology of man on the molecular level.
3. Wroclaw -- with specialization in the area of molecular enzymology, immunology, the evolution of regulatory systems, metallo-enzymes and neurology.
4. Krakow -- with specialization in the area of molecular mechanisms of hydrolytic and oxidizing enzyme activity, subcell photosynthesizing elements and the structure of biological membranes.

5. Gliwice-Katowice -- with specialization in the area of research on the structure of the genetic apparatus of regular and tumorous cells.
6. Lublin -- with specialization in the area of genetic control of biosynthetic mechanisms in the cells of small organisms.
7. Gdansk -- with specialization in the area of metabolic regulation and virology.

The greatest and most urgent needs in the area of construction investments are found in Warsaw, where a completed and approved building project for the Institute of Biochemistry and Biophysics of the Polish Academy of Sciences has been waiting for implementation for about 10 years. The quarters currently occupied by this Institute render further development of research and training of highly qualified cadre for the needs of the environment and other centers impossible. It is also necessary to erect a building for the planned Institute of Virology and Microbiology which, under present conditions, has no chance of performing scientific research work in the range necessary for the development of molecular genetics, experimental oncology, biological engineering and other directions.

In Poznan a building should be constructed for the Intercollegiate Institute of Biochemistry, the Isotope Team Laboratory, the Department of Human Genetics of the Polish Academy of Sciences and the Department of Plant Genetics of the Academy of Agriculture.

In Warsaw there is a need for erecting a building for research in the area of molecular enzymology, adapted to the specific needs of this research direction.

In Krakow the construction of quarters for the Institute of Molecular Biology of the Jagiellonian University and the Center of Biological Research of the Polish Academy of Sciences should be urgently accelerated.

In Gliwice the Department of Tumor Biology of the Institute of Oncology requires expansion.

In Lublin a building should be erected for the Intercollegiate Institute of Molecular Biology.

Gdansk needs to have an environmental animal enclosure constructed and a Department of Molecular Biology within the framework of the Faculty of Biology and Earth Sciences of the University of Gdansk.

An estimated calculation of the needs in the area of construction investments for the above-mentioned centers shows that in the coming years 12 new buildings with a total surface of about 100,000 m² should be built for molecular biology, for the sum of 1.4 million zlotys.

In the second stage, that is after 1980, investment financing should include other centers, namely in Lodz, Katowice, Bialystok, Olsztyn, Torun and Szczecin. Suitable recommendations in this area will be prepared at a later date.

Requirements in the area of apparatus equipment. The credits allotted for the purchase of apparatus, so far insufficient and irregular, in connection with the rapid development of experimental techniques used in molecular biology have led to a great need in the area of equipment. For the purpose of achieving maximal savings, but still in keeping with proper exploitation of apparatus, the present program places emphasis on reasonable and flexible organization of environmental laboratories for molecular biology. Consideration is given to the fact that many instruments of a unique nature must be installed along with laboratory support of standard value because of the contagious nature, toxicity or instability of the material investigated. In this connection it is anticipated that an environmental laboratory will be of a federated nature, that is, that the apparatus will be basically installed in environmental laboratory branches located in particular molecular biology institutes and also in the laboratories of other specialties, such as physical or chemical. Attention was also directed to the fact that many modern instruments, particularly expensive ones, have a very high degree of automation and great output. Therefore it is anticipated that some environmental laboratory branches will fulfill their function on a nationwide scale.

A comprehensive summary of the needs to purchase indispensable apparatus for the seven largest scientific centers in Poland gives the sum of about 30 million foreign exchange zlotys. This quota would be used primarily to purchase instruments unavailable in our country, but indispensable for the development of new programmed directions in research. The importation of reagents, compounds flagged with isotopes and inexpensive materials, without which rapid progress in the experimental disciplines of molecular biology is not possible, also require a new, simplified procedure. In our opinion the present system of importing chemicals and other materials is rather costly, time-consuming and inefficient.

Requirements for educating the cadres. Training cadres for the needs of molecular biology in the coming years requires particular care and many organizational decisions. School programs in the area of biology are not sufficiently modern and do not duly consider the basic regularities of living phenomena. School youth go to higher schools without an adequate awareness of biology and its physico-chemical basis. The recruiting commissions in medical and scientific departments generally state that the youth in secondary schools have the greatest difficulty with examinations in modern biology, which they simply do not know and do not understand. Further toleration of this condition will lead to intellectual crippling with incalculable consequences for the future generations of our society. The programs of teaching molecular biology in higher schools are excessively limited in time, and the obligation of implementing it falls on weakly

equipped teaching institutes without a sufficient number of didactic cadres. In this area the leading posts have particularly great needs in view of the tremendous didactic, research and service tasks levied on them. While the spread of technology is dominant in the content of the teaching programs, and disciplines in the humanities have now become duly respected in general education, "biologization" has been left practically on the sidelines of didactic and educational activity.

As a complement to the expansion and teaching of biology in secondary and higher schools, it will be necessary to form a system of specialization for higher school graduates accepting work in various scientific research institutes, in the scientific support of industry, in health and environmental protection, in agriculture and so forth. The previous system of doctoral studies cannot meet these tasks. It is expedient for at least a few higher institutions and a number of scientific research institutes, both those of the Polish Academy of Sciences and of ministries, to be included in the nationwide system of postgraduate education in various fields of molecular biology, with highly qualified cadres from various stations participating as much as possible. We should also emphasize the need for creating specialization in the area of biological engineering in polytechnical studies. Appropriate proposals for teaching modern biology and cadre specialization in this field will be presented to the proper ministries in the very near future by the Committee of Biochemistry and Biophysics of the Polish Academy of Sciences.

Educating the science cadre is of particular importance, because this will be the source of academic teachers making progress in science and of highly qualified personnel in industrial plants, agricultural stations and health services. A rapid development of molecular biology, significant changes in the point of concentration of research and constantly increasing development of experimental techniques will lead to the scientific cadre having to raise their qualifications rather through intensive self-study than by basing them on advanced courses programed higher up. Here various kinds of summer schools can be of considerable assistance, schools similar to those organized by CEMA and other international organizations, such as the Federation of European Biochemical Associations and the European Organization of Molecular Biology. For this as well as for other reasons the participation of Poland in these organizations should be intensified. However, the greatest role in raising the qualification of scientifically active workers, in increasing their intellectual competence and awareness of developmental tendencies is played by participation in symposia and conferences, and particularly by the opportunity for direct cooperation with leading centers throughout the world.

Conclusions

1. By the end of the current year in all academic centers in the country plans should have been worked out for the most effective use of cadres and apparatus support from the point of view of achieving the tasks set in the

government and focal programs, in which molecular biology will play an essential role. For this purpose molecular biology groups should be formed in the environmental section of the Polish Academy of Sciences.

2. In the first period intensive financing should be given to the seven most important scientific centers in Poland, that is, in Warsaw, Poznan, Wraclow, Krakow, Gliwice, Lublin and Gdansk. Other university centers should be included in the second period.

3. Regulations associated with the formation and functioning of environmental laboratories should be simplified and the importation of special reagents and inexpensive scientific aids should be facilitated.

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